ELECTRICITY FROM WASTE HEAT BY USING AN ORGANIC RANKINE CYCLE

Bruno Vanslambrouck*[1], Ignace Vankeirsbilck[1], Sergei Gusev[1], Michel De Paepe[2]

[1]Howest, University College of West Flanders
Electromechanics Department, Research Group on Energy Conversion
Graaf Karel de Goedelaan 5, 8500, Kortrijk, Belgium
E-mail: (Bruno.Vanslambrouck, Ignace.Vankeirsbilck, Sergei.gusev)@howest.be
Web page: http://www.howest.be; http://www.orcycle.eu
[2] Ghent University-UGent
Department of Flow, Heat and Combustion Mechanics
Sint-Pietersnieuwstraat 41, 9000 Gent, Belgium
E-mail:Michel.Depaepe@ugent.be
Web page: http://www.ugent.be/ea/floheacom/en

ABSTRACT

Within renewable energy installations such as biogas-, landfill gas- and bio oil engines, and even at all kinds of industrial plants lots of waste heat is dissipated into the atmosphere.
On the other hand, there is a proven, commercially available technology to convert it (partially) into electricity. This is the Organic Rankine Cycle (ORC), which has been used for several decades within f.i. geothermal plants. Applications of the same technology for waste heat recovery are rather premature.

To transfer this technology to such applications, practical research, in collaboration with industry was performed with the following output : technology review (used working fluids to replace water/steam, expander types...), a market overview, view on technical and economical feasibility, simulation models, comparison between the steam cycle and ORC and selection criteria, industrial case studies (landfill- and biogas engines, within steel, glass, paper, automotive, chemical and clay industry, water treatment).

As a conclusion, ORC-projects were found to be very attractive on renewable energy applications with the help of green certificates. On non-renewable industrial cases, economic feasibility strongly depends on integration costs and electricity prices.

To demonstrate the ORC-technology, a lab scale test facility has been built. As a result of industrial collaboration, a unique 11 kWe ORC unit has been composed and integrated as a scale model of the 50 and 250 kWe units that are commercially available already.

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